

PROCEEDINGS
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THE GENERIC STATUS OF CHRYSANTHRAX OSTEN
SACKEN.

[BOMBYLIIDÆ, DIPTERA.]

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The subgenus *Chrysanthrax* was erected by Osten Sacken for the reception of *Anthrax fulvohirta* Wiedemann and three allied species.* Subsequently the genotype was fixed by Coquillett as *fulvohirta*, a species widely distributed throughout North America.† The characters used by Osten Sacken in defining the subgenus, while rather minute and apparently trivial, appear to be correlated with characters of the pupa that warrant the acceptance of them as of generic value. According to the definition of Osten Sacken the distinguishing characters of the imagines are the fulvous pile on the thorax, and often a golden-fulvous tomentum on the abdomen; the dark brown antero-proximal half of the wings—without any paler aureoles on the cross veins within the brown; the punctiform contact of the fourth posterior and discal cells; the smooth tibiae; the tapering and indistinctly jointed front tarsi, beset on both sides with delicate erect hairs; the small front claws; the cone-shaped third antennal joint, merging into a style; the short conical face, etc.

Through the kindness of Mr. Otto Swezey, of Honolulu, I have been able to examine the empty pupal skin of a specimen of *fulvohirta* reared as a secondary parasite from *Elis sexcincta*, a primary parasite of white-grubs. This pupa presents charac-

* Biol. Cent. Amer., Vol. 1, 1886, p. 121.

† Type Species of North American Diptera, Proc. U. S. Nat. Mus., Vol. 37, 1912, p. 523.

ters that appear to me quite sufficient to warrant the generic separation of *Chrysanthrax* from *Hyalanthrax*, and very probably there are just as good characters available in the pupae of the other so-called subgenera which are as yet unknown in the pupal stages. It is necessary to indicate that in my paper, recently published, on this group I retained the generic name *Anthrax* for the two species of *Hyalanthrax* therein described—*hypomelas* and *lateralis*.* These two species and another that I have since obtained are primary parasites, and in this respect differ from *fulvohirta*, but I do not purpose suggesting that the species be separated generically on this account. There is in the structure of the head capsule of the two species a very great difference, and it is upon this character that the groups are entitled to generic and not subgeneric separation. The number and strength of the thorns which are present upon the head capsule of pupae of different genera of Nematocera, or the armature of the thoracic and abdominal segments are indices in great measure of the pupal habitats of the species that bear them. The cephalic spines are not only shields or sheaths for the antennae or other cephalic appendages, but are retained and used as instruments to assist in the work of emerging from the ground or other habitat—a process undertaken by the imago of this group before it leaves the pupal skin. In the paper just cited I have stated that I consider the absence of cephalic armature in the Tahanidæ and its presence in the Asilidæ to be due to the fact that the former are normally present only in soil that is damp or sandy and easily penetrated, while the latter (*Asilus et al.*) are almost invariably found in soil that is dry and much more compact. There is, therefore, a greater need for strong armature on the head in Asilidæ than there is in Tabanidæ, though both have abdominal locomotor spines. It is probably unnecessary for me to emphasize this fact further, but it may be of interest to restate the fact that the pupae of the Cyrtidæ have neither cephalic armature nor abdominal spines, neither being requisite for the emergence of the imago as the larvae are parasitic in spiders; and it is certainly interesting to discover that there is in conjunction with the different larval hosts of the species of *Chrysanthrax* and *Hyalanthrax* a coincident difference in pupal

* Bull. Ill. State Lab. Nat. Hist., Vol. XI, Art. 4, 1915, pp. 332-334.

structure. All three species of the latter genus that I have seen are internal primary parasites in lepidopterous or coleopterous larvae which do not spin tough cocoons, and all of them have the cephalic armature very similar, consisting of a pair of stout upper processes—which are contiguous at base and have the apices somewhat flattened but not thorn-like—a small lateral tubercle, and a similar small one on the central line near the lower margin. On the other hand, *Chrysanthrax fulvohirta* is parasitic upon a hymenopteron that spins a very tough cocoon, and in order that the imago of the fly may emerge therefrom it has the cephalic armature adapted to the purpose of cutting its way out. The upper pair of processes are widely separated at base and are thorn-like, their apices being sharp and slightly downwardly directed; the lateral thorn is about as large as either of the upper pair and of similar structure; the pair on the central line near the lower margin are similar to those of *Hyalanthrax*. It will be seen from the foregoing that the differences in the pupae are quite as great as are those between other genera in this family and even more distinct than the differences between some of the genera in Asilidæ.

I give herewith a synopsis of the difference between the pupae of the genera of Bombyliidæ known to me, and descriptions of those which I have not previously dealt with. The great majority of the pupae of this family may be distinguished at a glance from those of Asilidæ, which they most nearly resemble, by the armature of the body. The Asilidæ known to me have invariably the transverse abdominal armature in the form of stout spines which are usually alternately large and small in each series. In all the pupae of Bombyliidæ which I have seen this armature consists of very short, flattened thorns which are occasionally reflexed at bases and apices, and usually appear to be attached to, rather than a part of, the segment upon which they are located. Another character that at present seems to be of great value in separating the families is found in the structure of the lateral cephalic thorn (antennal sheath). In Asilidæ this consists of three to five thorns on a common base; in Bombyliidæ, either of a single thorn, which may be very small, or of two distinctly separated thorns.

KEY TO GENERA AND SPECIES.

1. Upper pair of cephalic processes thorn-like, widely separated at bases; lateral cephalic process or processes long, thorn-like . . . 2
- Upper pair of cephalic processes stout, not thorn-like, contiguous for the greater portion of their length; lateral cephalic process small, tubercle-like 7
2. Antero-lateral margin of head with a single long thorn 3
- Antero-lateral margin of head with 2 long thorns, the bases of which are contiguous 4
3. The transverse series of short thorns on abdominal segments 2-4 with their bases and apices turned up at right angles; labrum unarmed **Spogostylum anale*.
- The short thorns in transverse series on segments 2-4 turned up at apices only; labrum with a bifid thorn near apex
Chrysanthrax fulvohirta.
4. The short, stout thorns on abdominal segments turned up at bases and apices *Exoprosopa fasciata*?
- The short, stout thorns on abdominal segments turned up at apices only 5
5. Transverse armature of first abdominal dorsal segment consisting of a series of short, stout thorns on middle portion, and a number of long, slender, closely placed hairs on each side
Exoprosopa fascipennis.
- Transverse armature of first abdominal dorsal segment consisting of a few widely placed hairs, the middle portion either entirely bare or with very slight indications of small tubercles which do not appear as distinct thorns 6
6. Lower one of the pair of lateral cephalic thorns simple apically, but with a small wart-like protuberance at base on lower surface, the small wart bearing 2 distinct hairs; wings without discal protuberances *Sparnopolius fulvus*.
- Lower one of the pair of lateral cephalic thorns with a short sub-apical protuberance, the apex of thorn turned upward, base simple; wings each with a pair of protuberances, one about one-fourth from base and the other near middle . *Anastoechus nitidulus*.
7. Eighth ventral abdominal segment without hairs on disc
Hyalanthrax hypomelas.
- Eighth ventral abdominal segment with hairs on disc 8
8. Eighth ventral abdominal segment with 2 hairs on each side of disc; distance from the pair of thorns on lower central portion of head to apex of basal portion of sheath of mouth parts about 4 times as great as distance from the latter to apex of proboscis
Hyalanthrax lateralis.
- Eighth ventral abdominal segment with 10-12 long hairs on disc; distance from the pair of thorns on lower central portion of head to apex of basal portion of sheath of mouth parts about twice as great as distance from the latter to apex of proboscis
Hyalanthrax alternata.

* This genus name has been emended to *Spogostylum* by some European authors. (See Verrall, "British Flies," Vol. 5, 1909, p. 517.)

DESCRIPTIONS OF PUPAE.

***Chrysanthrax fulvohirta* Wiedemann.**

Anthrax fulvohirta Wiedemann, Dipt. Exot., 1821, p. 149.

Chrysanthrax fulvohirta (Wiedemann) Osten Sacken, Biol. Cent. Amer., Vol. 1, 1886, p. 122.

Length, 13 mm. Whitish testaceous, slightly shining, cephalic and abdominal thorns dark brown. Head with six strong thorns, the upper 4 stout, the lower central pair more slender and shorter; the hairs above bases of thorns stronger than normal; lateral view of head as in Figure 14, anterior view as in Figure 13; basal section of sheath of mouth parts (labrum) with a bifid thorn near apex. Thoracic spiracle distinct, its margin formed of small bead-like swellings, the open side (i. e. the break in circle) directed backward; discal hairs on thorax long and strong, 4 in number and in the normal positions; wing with a small subcostal protuberance about one-third from base; wings extending to middle of second ventral abdominal segment; mid legs extending beyond wings as far as apex of fourth tarsal joint; hind legs extending beyond wings as far as apex of second tarsal joint; the tip of tarsi reaching to apex of fourth ventral segment; surface of thorax smooth. Abdomen with spiracles well defined, similar in form to those of thorax, the open side directed forward; first dorsal segment with 6 long bent hairs on each side of disc, the central portion without short thorns; transverse armature of second dorsal segment consisting of rather closely placed, short, stout thorns which are reflexed at apices, do not extend to lateral margins and, except in central portion, are interspersed with long fine hairs which are carried to lateral margin; thorns progressively weaker and more widely placed on the following segments, and the hairs more numerous and rather longer until on the seventh segment they alternate with the thorns; eighth segment with 3 short thorns and 4 long hairs; lateral margin (post-spiracular) of first segment with 7-8 long stout hairs, those on segments 2-7 more numerous and weaker; eighth segment with 4-5 hairs; ventral segments 2-7 each with a median transverse series of long hairs, each series with distinct but short interruption at middle; eighth segment without discal hairs; apical segment as in Figure 12, the lateral apical margins tridentate, the teeth or thorns progressively stronger from lower to upper.

The specimens from which the description is drawn was sent me by Mr. Otto Swezey. It was obtained at Urbana, Ill., April 25, 1914, by Mr. G. N. Wolcott, at which time it was still inside of the cocoon of *Elis sexcincta*, a primary parasite of *Phyllophaga (Lachnosterna)* spp. Mr. Swezey has recorded the occurrence of *fulvohirta* as a secondary parasite on *Elis*. The species is common throughout the greater portion of the United States and is represented in the collection here by specimens from the following Illinois localities: Havana, Dubois, St. Francisville, Meredosia, Topeka, Muncie, Jonesboro, Quincy, Pekin and Metropolis. The dates range from the beginning of August till September 19. There is

also in the collection a specimen from Westville, N. J., taken August 23. The southern range of the species extends into Mexico and Florida.

Anastoechus nitidulus Fabricius.

Bombylius nitidulus Fabricius, Syst. Antl., 1805, p. 132.

Systoechus nitidulus (Fabricius) Schiner, Fauna Austr., Vol. 1, 1862, p. 63.

Aanastoechus barbatus Osten Sacken, West. Dipt., Bull. U. S. Geol. and Geogr. Surv., Vol. 3, No. 2, 1877, p. 252.

Length, 8.5 mm. Whitish testaceous, slightly shining, cephalic and abdominal thorns dark brown. Cephalic armature consisting of 8 strong thorns, the upper pair widely separated, their apices acute; lateral pair on a slight eminence, the lower one boot-shaped at apex; central pair on lower margin as long as the other pairs, their bases swollen and fused; lateral view of head as in Figure 3, anterior view as in Figure 2; proboscis extending to apex of wings, slightly tapering from base to apex. Surface of thorax irregularly reticulated; spiracle of moderate size, margin raised; discal hairs weak (only one—that above anterior portion of wing-base—visible in specimen); a small, sharp, ridge-like tubercle at base of wing and two slight swellings on the disc, one about one-third from base and the other about one-third from apex, the former near costa, the latter on median line; wings extending to middle of third ventral segment of abdomen; hind tarsi extending to middle of fifth. First dorsal abdominal segment with one or two short hairs laterally and a few very weak, indistinct, widely placed thorn-like elevations on central part of the transverse series; segments 2-8 each with a very regular transverse series of short, stout thorns which stand almost upright and are interspersed with weak and exceptionally short hairs; spiracles small but distinct: post-spiracular area of first segment with 5-6 very stout and moderately long hairs; the post-spiracular hairs on other segments weak and rather short; ventral segments except the eighth each with 3 hairs on each side of median line in a transverse median series; apical segment on each side with a strong upwardly turned thorn above and a small backwardly directed one below, as in Figure 1.

The specimen from which the foregoing description was drawn was sent me by Mr. Hyslop, of the U. S. Bureau of Entomology. The pupa was obtained under a stone at Wilbur, Washington, in the Big Bend country of that State. The larval habits are unknown.

The species was originally described from Europe and was re-described by Osten Sacken from America. The synonymy is according to Coquillett, who decided from an examination of American and European examples that the species are identical. Judging from published records the species occurs in the west more commonly than in the east. The following States are mentioned by Aldrich* as those in which it is known to occur: Wyoming, Colorado, California, Massachusetts, and New Mexico.

* Cat. North Amer. Dipt., 1904, p. 237.

***Hyalanthrax alternata* Say.**

Anthrax alternata Say, Jour. Acad. Nat. Sci. Phil., Vol. 3, 1823, p. 45.

Anthrax consanguinea Macquart, Dipt. Exot., Vol. 2, Pt. 1, 1841, p. 69.

Anthrax scrobiculata Loew, Berl. Ent. Zeitschr., 1869, p. 24.

Anthrax stenozona Loew, Berl. Ent. Zeitschr., 1869, p. 25.

Hyalanthrax stenozona? Osten Sacken, Biol. Cent. Amer., Vol. 1, 1886, p. 138.

Length, 15 mm. Whitish testaceous, slightly shining, cephalic and abdominal thorns dark brown. Upper pair of cephalic processes very stout, contiguous for the greater portion of their length, their apices flattened and truncate (Fig. 7); lateral processes much larger than in *lateralis* and more slender than in *hypomelas* (Figs. 9, 10, 11); distance from base of ventral thorns on lower margin of face to apex of first section of sheath of mouth parts less than twice the length of the apical part of the latter (Fig. 4), the corresponding distance in *lateralis* and *hypomelas* differing from that in *alternata* as shown in figures 5 and 6. In the armature of the abdomen *alternata* differs from *hypomelas* and *lateralis* in the complete transverse median series of hairs on the eighth ventral segment, these hairs being absent in *hypomelas*, and *lateralis* having but two on each side. Lateral view of apical abdominal segment as in figure 8.

I have before me two pupae of *alternata*, one received from J. J. Davis and the other from J. A. Hyslop, both of the U. S. Bureau of Entomology. The example sent by Davis is that of a specimen reared from a lepidopterous pupa; the one from Hyslop is that referred to by him in a recent paper* on the life history of *Meracantha contracta*, in the larvae of which the species is parasitic.

The three species of this group that I have examined are very closely allied and are readily distinguished from other Bombyliidæ known to me by the stout upper cephalic processes, which are closely contiguous at base, and by the very small size of the lateral cephalic processes and their close approximation to the central line of the head, their bases being but little farther from that line than are those of the upper pair.

* Psyche, Vol. 22, 1915, p. 44.

EXPLANATION OF PLATE I.

- Fig. 1. *Anastocchus nitidulus*, lateral view of apex of pupa.
Fig. 2. *Anastocchus nitidulus*, front view of head of pupa.
Fig. 3. *Anastocchus nitidulus*, lateral view of head of pupa.
Fig. 4. *Hyalanthrax alternata*, front view of mouth parts of pupa.
Fig. 5. *Hyalanthrax hypomelas*, front view of mouth parts of pupa.
Fig. 6. *Hyalanthrax lateralis*, front view of mouth parts of pupa.
Fig. 7. *Hyalanthrax alternata*, dorsal view of upper cephalic processes
of pupa.
Fig. 8. *Hyalanthrax alternata*, lateral view of apex of pupa.
Fig. 9. *Hyalanthrax hypomelas*, lateral cephalic process from below.
Fig. 10. *Hyalanthrax lateralis*, lateral cephalic process from below.
Fig. 11. *Hyalanthrax alternata*, lateral cephalic process from below.
Fig. 12. *Chrysanthrax fulvohirta*, lateral view of apex of pupa.
Fig. 13. *Chrysanthrax fulvohirta*, front view of head of pupa.
Fig. 14. *Chrysanthrax fulvohirta*, lateral view of head of pupa.